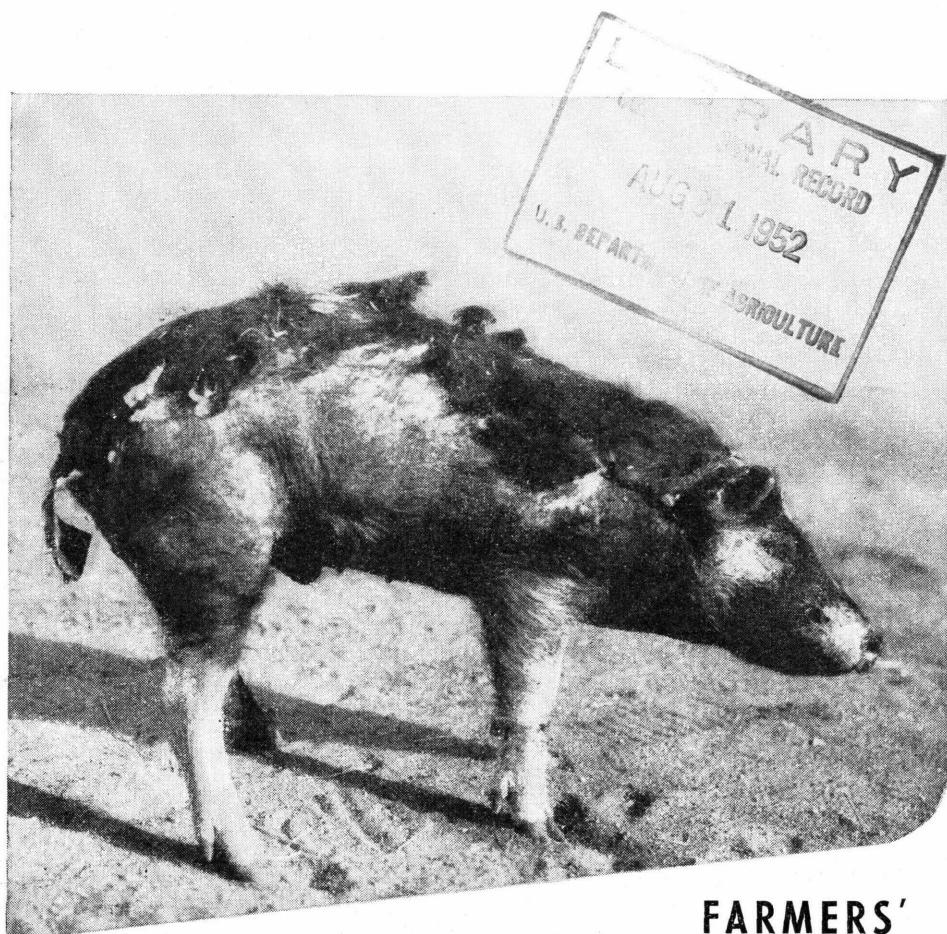


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# DISEASES OF SWINE



FARMERS'  
BULLETIN  
No. 1914

U. S. DEPARTMENT OF AGRICULTURE

**S**WINE are subject to many diseases, some of which are readily communicable. They are subject also to infestation with parasites. Parasites, by taking nourishment the pig needs to put on flesh, are particularly injurious to young stock. They do further harm by sucking blood, setting up mechanical obstructions, secreting toxins, and transmitting disease. Young animals that are heavily parasitized make unsatisfactory gains and become stunted.

Swine owners are interested primarily in raising healthy animals that will finish for market at an early age. Even under the best conditions, however, hogs sicken. Correct diagnosis of the trouble is essential for effective treatment, especially in case of a communicable disease. To assist himself and the veterinarian, the swine owner should observe his animals frequently and closely in order to become familiar with their everyday condition and thus be able to detect any deviation from it. He should be ready to give the veterinarian all these details, as well as complete information on the feed and any home remedies given the sick animals. The veterinarian needs the full herd history to arrive at a correct diagnosis.

Any attempt to ship diseased hogs to market or to public sales barns instead of giving them proper attention and treatment is criminal. Not only may the animals in such illegal shipments die in transit, but they may communicate disease to previously uninfected hogs.

Federal and State regulations prohibit the moving of diseased swine from one point to another.

If any symptoms in the herd indicate the onset or the presence of a serious communicable disease, the owner should notify a local practicing veterinarian, the State veterinarian, or an official of the State livestock sanitary association.

This bulletin outlines the general methods of preventing the common diseases of swine and the measures for controlling them if they become established in a herd. More detailed information is given in other publications of the Department. Copies of the following Farmers' Bulletins may be obtained on request to the U. S. Department of Agriculture, Washington 25, D. C.: No. 834, Hog Cholera; No. 1085, Hog Lice and Hog Mange; Methods of Control and Eradication; No. 1437, Swine Production; No. 1490, Hog-Lot Equipment; No. 1736, Anthrax; No. 1787, Internal Parasites of Swine; and No. 1991, The Use of Disinfectants on the Farm.

This bulletin supersedes Farmers' Bulletin 1244, Diseases, Ailments, and Abnormal Conditions of Swine.

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Washington, D. C.

Issued September 1942  
Revised July 1952

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For sale by the Superintendent of Documents, U. S. Government Printing Office  
Washington 25, D. C. - Price 10 cents

# DISEASES OF SWINE

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## PREVENTION OF DISEASES

**M**OST DISEASES, ailments, and abnormal conditions of swine are preventable to a large degree. Prevention through sanitation is highly effective and economical. Especially in the Northern and Central States, provision for housing hogs properly during bad weather is essential for best returns. This is particularly true following immunization against a disease such as hog cholera where weakened resistance in an animal, caused by exposure, may result in a "poor take," or failure to provide adequate immunity. The shelter need not be expensive but should be on well-drained ground and readily accessible for thorough cleaning and disinfection. In addition, it should have a tight roof and good ventilation without drafts, and the bedding should be reasonably dry.

<sup>1</sup> This is revision of a former edition by C. G. Grey and C. N. Dale.

Correct feeding with products adequate in vitamin content or supplemented with required vitamins, free access to water at all times, and a good mineral mixture are important in preserving the health of swine. A suitable mineral mixture may be made with equal parts of bonemeal, ground limestone, and salt. The addition of 0.02 percent potassium or sodium iodide is recommended in "goiter districts." This mixture should be kept before the hogs at all times.

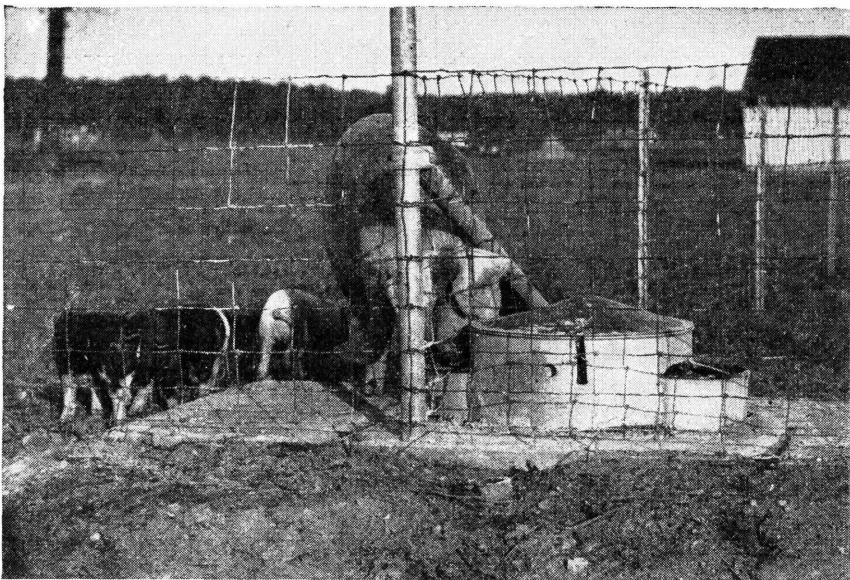
The old idea that unthrifty swine require some tonic or conditioner has been given up. Well-informed and successful swine producers now realize that when unthriftiness occurs the most economical procedure is to direct their efforts toward finding the cause of the trouble so that specific remedial measures may be adopted. Many swine producers have found it advisable and profitable to consult a veterinarian in regard to unthriftiness in swine rather than to administer tonics.

Garbage feeding, a big problem in itself, requires special precautions under various conditions to prevent the introduction of disease among healthy animals. Raw pork scraps may, and often do, contain the causative agents of swine diseases. Feeding uncooked pork scraps is a common method of spreading cholera.

Swine should not be given grain, garbage, or similar feed on the ground. They thrive best when fed on feeding floors or platforms, preferably of concrete, or from troughs of some nonabsorbent material that can be cleaned, washed, and disinfected frequently.

Clean drinking water, preferably from an automatic drinking fountain which does not overflow should be available at all times (fig. 1).

Parasites, even those that may not by themselves cause death, tend



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FIGURE 1.—Automatic waterer connected with the supply line makes water available at all times. The concrete platform slopes toward the roadway to carry drainage out of the hog lot, tending to eliminate hog wallows.

to lower the resistance of their hosts to such an extent that invasion by disease agents is made easy and losses from disease result. Therefore, the control of internal parasites is an important part of any disease-prevention program.

If pigs are pot-bellied, rough-coated, and generally unthrifty but have no fever, with or without thumpy coughs, they are parasitized, and something is radically wrong with the sanitary procedures on the farm. If swine production is to be carried on profitably a program of treatment and prevention must be maintained.

Parasites have tissues similar in many ways to the tissues of the host animals in which they live. Naturally, drugs toxic enough to harm the parasites, if not properly administered, may cause considerable damage to the host. Therefore, it is necessary that diagnosis and treatment for parasites be left to a veterinarian who will ascertain which type or types of parasites are involved and will select and administer his drugs accordingly, graduating the dosages so that they will be suitable for the age, weight, and condition of the animals receiving them.

Prevention plays a major part in the control not only of parasites but also of the diseases discussed in the following pages of this bulletin. A swine sanitation system which is highly effective in disease and parasite control, consists in putting clean sows in clean farrowing pens, moving the sow and pigs to clean pasture, and keeping them there until the pigs are 4 months old or older. To prevent losses due to navel infection, treat the navel of each pig with tincture of iodine as soon after birth as possible. This may also serve to eliminate many cases of enlarged joints.

## **INFECTIOUS DISEASES**

### **HOG CHOLERA**

Hog cholera is the most serious swine disease. Losses in a single year have been as high as \$65,000,000, and the probable average annual loss for any 10-year period has amounted to about \$20,000,000. These losses occur even though the biological products developed for the immunization of swine against cholera are a highly effective preventive when properly used. The injection of serum, of serum and virus, or of a vaccine (of which there are several types), is only part of the problem of preventing losses from this disease.

**CAUSE.**—Hog cholera is caused by a filtrable virus so small as to be invisible even with a powerful microscope. The virus can pass through the pores of filters which hold back ordinary disease-producing germs. After passing through such filters, upon inoculation into susceptible swine, the virus will cause hog cholera. The virus is present in the blood and other body tissues of an affected animal and also in the urine and feces and in the secretions of the eyes and nose. The only way to find out whether the virus is present in these substances is to inject them into cholera-susceptible and cholera-immune pigs. Usually bacteria-free filtrates of the blood are used. In a disease such as encephalomyelitis in horses (sleeping sickness), mice and guinea pigs can be used to detect the presence of the causative virus, but swine are the only animals that can be used to detect the virus of hog cholera.

**PERIOD OF INCUBATION AND SYMPTOMS.**—The period of incubation is the time elapsing between the entrance of the virus into the body and the appearance of the first symptoms of the disease. This period may be 3 to 7 days, but most cases show symptoms on the fourth day after exposure.

There are many ways by which hog cholera may be introduced into a herd. Commonly only one or two pigs sicken at first; several days may pass before more animals become sick. When the disease is introduced by means of a scrap of raw pork which contains hog-cholera virus, the pig eating it becomes infected. At least a couple of days pass before the urine from this pig contains virus. Other pigs eating feed contaminated with this urine will become infected. However, the period of incubation must elapse before these pigs show symptoms. Thus when cholera is introduced in a herd only one pig may be sick, and others will not show symptoms until several days later. This characteristic of the disease shows the importance of being concerned even though only one pig in a herd becomes sick.

Separate any sick pig from the healthy pigs immediately. This measure, together with early diagnosis, if the trouble is due to cholera, will go far toward limiting the losses in the herd, provided the healthy animals are in a condition to be and are properly immunized. Consulting a veterinarian and possibly sacrificing the first pig to sicken for a post-mortem examination may be far more economical than waiting until symptoms appear in other pigs as a result of exposure to the first one. Once an animal has shown visible symptoms, the possibility of recovery is very doubtful, regardless of any treatment. At this period the only treatment that may be beneficial consists in giving large doses of anti-hog-cholera serum.

**SYMPTOMS.**—Usually in uncomplicated cases the first symptom is a partial or complete loss of appetite. At this time there is fever, the temperature usually being 105° to 106° F. There may be constipation, followed in a few days by diarrhea. Symptoms of coughing may be apparent, and the eyes may be inflamed and filled with a whitish discharge, which gums them together. Later brownish crusts may cover the edges of the eyelids. As the disease progresses the pig shows weakness, depression, and staggering gait and becomes gaunt and tucked up in the flank (fig. 2). Reddish or purplish discoloration of the skin of the ears, belly, and legs is frequently observed.

**LESIONS.**—Post-mortem examination may reveal some or all of the following lesions. Hemorrhages (small dark-red spots) showing through the covering of the kidneys, and bright-red blotches on the surface of the lungs and the outer covering of the intestines. Pneumonia is common in advanced stages of the disease. The lymph glands are congested and enlarged, those at the angle of the lower jaw, in the flanks, and in the fat of the intestines showing up most.

Small red blotches may be found on the inner lining of the bladder and on the heart. In the advanced or chronic stage, large buttonlike ulcers may be seen on the mucous membrane (inner lining) of the large intestines near the point where the large and small intestines join.

In uncomplicated cholera, characteristic lesions are common. However, secondary diseases such as *Salmonella* infection (*Salmonella*



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FIGURE 2.—Pigs sick with hog cholera, advanced stage.

*choleraesuis*) and swine plague are frequently associated with cholera. In such cases the lesions of the secondary diseases may obscure the cholera lesions. Pneumonia often accompanies hog cholera.

**PREVENTION AND TREATMENT.**—There is no dependable treatment for a hog visibly sick with hog cholera. Owing to the sudden onset and the rapid spread of the disease, herds should be constantly protected against infection. By protection is meant the regular immunization of all pigs, usually at weaning time, by practicing veterinarians using hog-cholera serum and virus, or vaccine prepared specifically for the purpose. Cleanliness in the hog lot, the pen, and the shelter is conducive to the welfare of the herd. Proper housing, disinfection of quarters from time to time, well-fenced lots to protect against infection carriers, and care in feeding aid in keeping the herd free of disease.

If a neighboring farm has a hog-cholera outbreak, stay away from it. Any person coming from that farm to a normal herd may carry infective material. Cleanliness and good sanitary methods alone, however, are not complete safeguards against hog cholera. It may be introduced by feeding garbage or kitchen or table scraps containing bits of pork trimmings, rinds, or bone. Great care should be used to avoid feeding such offal to cholera-susceptible swine. Before garbage feeding is undertaken all hogs should be properly immunized with serum and virus. When a herd is attacked by hog cholera, prompt attention is essential to prevent heavy losses. Treatment for immunization should be administered as soon as the disease is recognized or preferably when there is reason to suspect that the animals have been exposed to the infection. The carcasses of all dead hogs should be burned or deeply buried. After the sick ones have recovered or been destroyed and no further spread of the disease is noted, all quarters to which the animals have had access should be cleaned and disinfected.

A 2-percent solution of common lye, or 2½ ounces of lye per gallon of water, is an effective disinfecting agent.

Anti-hog-cholera serum is primarily an immunizing agent to be used with hog-cholera virus to prevent the occurrence of hog cholera. However, when used in the early stages it seems, in some cases, to have a curative effect. If hog cholera is suspected, always call a veterinarian.

#### Diseases and Conditions Resembling Hog Cholera

Diseases that may be confused with hog cholera or that go unnoticed during hog-cholera outbreaks, include anthrax, epilepsy, gastro-enteritis, necrobacillosis, pleurisy, pneumonia, poisoning, swine plague (hemorrhagic septicemia), swine erysipelas, swine influenza, tuberculosis, and worm infestation. Any deviation from the normal in the gait, appetite, or digestion, or other function of an animal deserves the closest watching in order that measures may be taken to prevent serious results. Although some minor ailments of swine may be treated successfully by the owners, it is always well, in case of doubt, to call for more experienced service.

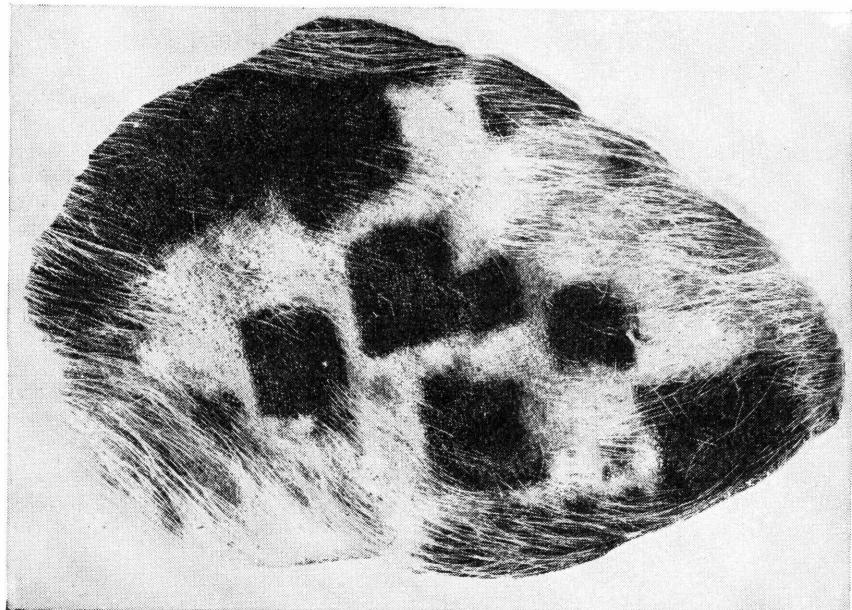
#### SWINE ERYSIPelas (DIAMOND-SKIN DISEASE)

Swine erysipelas is one of the more important diseases of swine, particularly in the Midwest, where the disease occurs in an acute and sometimes rapidly fatal form. The disease frequently assumes a chronic form involving the joints and occasionally is observed as the so-called "diamond-skin disease." (Fig. 3.) This disease is also seen in sheep and turkeys and occasionally in other domestic animals. Infection in human beings is not uncommon following butchering or handling of diseased meat and meat products.

**CAUSE.**—Swine erysipelas is caused by a specific micro-organism, *Erysipelothrix rhusiopathiae*. This organism is eliminated from the bodies of infected hogs and from so-called "healthy carriers," by way of the feces and urine. It is believed that hogs pick up the infection through the ingestion of contaminated feed and water. However, the infection may also gain entrance through minor cuts and scratches and by biting insects. The disease may occur at any season of the year but is most common in the spring, late summer, and fall.

**SYMPTOMS AND LESIONS.**—Without the aid of trained men and laboratory facilities, swine erysipelas may be extremely hard to differentiate from hog cholera, acute swinepestifer infection, secondary infections of either the skin or joints, photosensitization with peeling of the skin, and low level of nutrition. In the acute stage of the disease, there may be one or more sudden deaths, high temperature, loss of appetite, stiff gait, and arched back. Sick hogs withdraw from the herd and lie in their beds but upon being disturbed start off with alacrity.

Hogs that survive the acute stage may go on to complete recovery, or they may be afflicted with chronic arthritis, characterized by enlargement and stiffness of the joints. This, the arthritic form, is the type of swine erysipelas most frequent in hogs in this country, giving rise to the statement that the hogs have rheumatism. The temperatures of such animals return to normal, but, owing to pain on moving the affected joints, or to weakness, or to the condition of the heart valves, such animals may spend much of their time lying on their



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FIGURE 3.—A section of skin from a pig affected with the urticarial form of swine erysipelas. The diamond-shaped areas remain on the skin after the hair has been removed.

breastbones or sitting upright. At this stage many secondary changes may occur, such as gangrenous involvement and sloughing of the skin of the ears, snout, back, sides, and tail. (Cover illustration, courtesy of Floyd Cross, Colorado A. & M. College.) Hogs that apparently were not affected with the acute form of the disease may show the enlarged joints and stiffness that indicate the arthritic form of the disease.

The urticarial form of swine erysipelas may be recognized by the diamond-shaped, dark-red, or purplish areas of irregular size on the infected animals (fig. 3). These areas turn white when pressed with the hands.

Post mortem examination may show congestion of the internal organs and inflammation of the stomach, small intestines, and urinary bladder. However, the lesions in this disease are not always constant and may resemble those of hog cholera. A positive diagnosis of this disease must include the finding of the organism by laboratory examination.

**PREVENTION AND TREATMENT.**—Immunization of swine by vaccination with live culture and serum under a cooperative State and Federal program, is a worth while aid in controlling this infection. Anti-swine-erysipelas serum alone or in combination with penicillin properly administered in the early stages of the disease has considerable curative value. Since even trained observers have difficulty in distinguishing between swine erysipelas and other septicemic conditions in swine, the swine producer, instead of trying indiscriminate treat-

ments, should call a veterinarian to make positive diagnosis with the aid of laboratory examinations and to prescribe proper procedures.

When swine erysipelas breaks out in a herd, the healthy animals must be removed immediately to clean ground and treated with serum. The visibly affected animals, if not too far gone, should be given serum and removed to a pen away from the healthy hogs. Those with the chronic form of the disease should be removed from the herd and destroyed as they rarely pay their way and serve only to maintain a source of further infection in the herd. Dead animals should be covered with lime, and buried so deep that other hogs, dogs, and rodents cannot reach the carcasses and thus spread the infection. Infected houses, pens, feeding troughs, and other equipment should be thoroughly scraped, scrubbed, and disinfected. A hot 2-percent lye solution is an efficient disinfecting agent.

Here, as in hog cholera, remember that pork scraps may be a source of danger when fed to swine.

Soil infection plays an important part in the spread of swine erysipelas. Following an outbreak in a herd and the removal of the healthy animals to clean ground, a system of crop rotation should be begun on the old infected ground. The most effective means of cleaning a hog lot following any disease is to remove all litter and spread it on fields where the hogs will not come in contact with it, plow up the lot, and sow wheat, rape, rye, or some other forage crop. Exposure to sunlight and drying, provided hogs are not present to keep the organism alive by passing it through their bodies, may in time bring about destruction of the organism.

#### TUBERCULOSIS

Tuberculosis in livestock in general is caused by one of three types of tuberculosis germs: Bovine (cattle), avian (poultry) or human. Prior to, and during, the early period of the campaign for the eradication of tuberculosis in cattle, a large percentage of tuberculosis in swine was due to the bovine type and resulted from feeding on the feces or milk of tuberculous cattle.

As eradication progressed, observations revealed many tuberculous swine still coming from modified accredited areas which were relatively free from tuberculous cattle. Further investigations disclosed that the poultry on the farms from which the infected swine originated had tuberculosis. Tests showed that the germ causing the disease in these pigs was of the avian type. It is now known that most of the tuberculosis in swine is due to the avian germs.

The proportion of tuberculosis in swine due to the human type of germ is relatively slight, as the opportunity of exposure to this germ is comparatively uncommon.

**SYMPOTMS AND DIAGNOSIS.**—Most swine affected with tuberculosis never show any symptoms of the infection. However, such animals would give a positive reaction to the tuberculin test. In advanced stages, symptoms of digestive disturbance and cough may be shown. Occasionally lesions in the bones or joints may cause lameness and other visible indications. Without the aid of the tuberculin test, diagnosis is generally made by finding the tuberculous lesions on post-mortem examination. The trained inspector knows the common loca-

tion and appearances of these lesions. Tuberculosis in swine is usually detected in packing plants by veterinary inspectors. However, since tuberculous poultry are a source of infection in swine, a swine producer should, at least, take the precaution of finding out whether any poultry which may come in contact with the swine are tuberculous. With no possibility of contact with tuberculous poultry or cattle it is reasonably safe to assume that the swine are free from the infection.

**PREVENTION.**—Detailed information on the eradication and prevention of this disease from poultry and swine is given in United States Department of Agriculture Leaflet 102, Eradicating Tuberculosis from Poultry and Swine, and Farmers' Bulletin 1652, Diseases and Parasites of Poultry.

#### **SUIPESTIFER INFECTION (PARATYPHOID, NECROTIC ENTERITIS, SWINE TYPHOID, "NECRO")**

Suapestifer infection is general but perhaps more prevalent in some sections than in others. As its name indicates, this condition is the result of infection with a micro-organism, *Salmonella choleraesuis* (*suapestifer*), which is a member of the paratyphoid group. This organism is peculiar in that it may be present in many hogs without causing any appreciable damage; that is, the animals are carriers of the organism. However, this organism may become active when a change takes place in the carrier animal. This may be a feeding disturbance, the result of infection with viruses such as those of hog cholera or swine influenza, or other change in the animal's environment. Once the organism becomes active in the carrier animal, it may spread readily to other animals and produce a definite disease condition.

The suapestifer organism often becomes very active when the hog-cholera virus enters the body of an animal that had harbored it without any appreciable damage. The changes in the animal that result from the hog-cholera infection give the *Salmonella* organism a chance to exert its virulence and invade the body tissues, where it produces definite lesions. When present in the various organs of the infected animal, the organisms may pass, along with the hog-cholera virus, to otherwise normal animals in which they produce a very serious condition. *Salmonella choleraesuis*, it is thought, has played a part in hog-cholera outbreaks. Great caution is necessary in immunizing hogs with hog-cholera virus and a anti-hog-cholera serum in herds known to be infected with the *Salmonella* organism. The role of *S. choleraesuis* as a secondary invader in connection with hog cholera, swine influenza, and other infectious diseases is not considered here—only the disease it produces. Two forms of this disease—acute and chronic—are generally recognized.

##### **The Acute Form**

In its acute form the disease is known as paratyphoid, pig typhus, swine typhoid, or suapestifer infection. It may affect swine of any age, but young pigs and shotes appear to have less resistance to the infection than older swine. As a primary infection it appears to be very limited in the United States. The affected pigs exhibit a rise in temperature, refuse to eat, and are disinclined to move even when forced. They may have diarrhea or may be constipated. Within 2

to 4 days, or even less, such animals often die. A red color, changing to purple, appears on the skin of the ears, abdomen, inner sides of the thighs, and sometimes on other parts of the body.

**POST MORTEM APPEARANCE.**—Autopsy reveals purplish discoloration of the tonsils and surrounding tissues and sometimes necrotic lesions in the tonsils. The epiglottis is frequently congested and has a reddish, muddy appearance. The submaxillary, cervical, and bronchial lymph glands are congested, and usually have a very deep red color. Other lymph glands of the body often have a similar appearance. The spleen and liver frequently are enlarged due to congestion. The kidneys are darker than normal, and in some instances have a characteristic dark mahogany color. Sometimes the kidneys show hemorrhages like those seen in hog cholera. The bladder shows varying degrees of inflammation. There is frequently marked inflammation of the stomach, often confined to the fundus portion. The small and large intestines are inflamed sometimes to the extent that blood escapes from the vessels of the intestinal wall, making the intestinal contents bloody.

**DIFFERENTIAL DIAGNOSIS.**—An infection of this type is not readily distinguished from some of the more common septicemic diseases of swine. Frequently laboratory examination is necessary to make a definite diagnosis. Herd history, field examination to eliminate other infections, and post mortem examinations are helpful in arriving at a clinical diagnosis. As this infection is frequently secondary to hog cholera, a disease outbreak in swine should be diagnosed as an acute primary paratyphoid infection only after the possibility of the presence of hog cholera has been definitely eliminated.

#### The Chronic Form

In its chronic form the disease is known as necrotic enteritis, necro, or paratyphoid.

Recently attention has been given to the relationship of nutrition to the development of the chronic form of the disease. This type of suipestifer infection generally begins with a rise in temperature, diminished appetite, and diarrhea. After a few days the temperature may return to normal and the appetite improve, but the animals remain unthrifty and fail to gain in weight. Emaciation, weakness, prostration, and death often follow, particularly when no efforts are made to control the disease.

The lesions of the internal organs are confined chiefly to the gastrointestinal canal. Necrosis in varying degrees is often found in the tonsils. The intensity of the involvement of the stomach may vary greatly. In some cases the lining of the stomach is normal. In others the alterations vary from slight or marked inflammation to extensive necrosis. The small intestines may also show inflammation and necrosis, but it is the linings of the cecum and colon that generally show the most advanced lesions. Here the walls may be several times thicker than normal owing to the gray cheesy deposits of dead tissue. A number of factors may lower the resistance of swine, particularly young pigs and shotes, so that they are more severely affected by the disease. Exposure to inclement weather, the fatiguing effects of transportation, feeds lacking in essential minerals, vitamins, and protein, and reactions due to swine-erysipelas and hog-cholera vaccination

have long been recognized as debilitating factors. Numerous investigations of the relationship of nutrition to the development of this disease have been reported. Until further information on the exact relation of nutrition to the disease is available, the following points should be kept in mind:

Necrotic enteritis is a chronic form of suipestifer infection.

A vitamin deficiency, presumably nicotinic acid in particular, will produce a disease in swine, some aspects of which may simulate necrotic enteritis.

When similarly exposed, pigs affected with this vitamin deficiency may be subject to a severer form of necrotic enteritis than pigs not so affected.

When the rations are deficient, such supplements as nicotinic acid and possibly other factors of the vitamin B complex are advised for the prevention and treatment of the deficiency disease.

No known medicinal preparation has sufficient merit to be recommended as a specific treatment for necrotic enteritis. Various remedies have been used but frequently with little success.

Rigid enforcement of swine sanitation (p. 1) has often been effective in the prevention and control of necrotic enteritis. After the disease has become established in a herd, favorable results in its control have been obtained by separating the apparently healthy pigs from the sick and placing them in clean quarters or on ground not previously used for swine. This group should be observed closely, and if any animals show symptoms of illness they should be removed immediately.

#### SWINE DYSENTERY

Swine dysentery, also known as infectious hemorrhagic enteritis, swine typhus, bloody diarrhea, bloody scours, bloody dysentery, bloody flux, black scours, and colitis (inflammation of the colon), has been reported in many sections of the country, but it appears to be most common in the Midwest. The history of the outbreaks shows that usually the affected animals have been either directly or indirectly in contact with sales barns or public stockyards.

**SYMPTOMS.**—Swine dysentery is considered to be an acute infectious disease. Its outstanding symptom is usually a profuse bloody diarrhea. Sometimes the feces are black instead of bloody and contain shreds of tissue. Some of the affected animals go off feed; others show no loss of appetite. They may have fever but the temperature usually is lower than in hog-cholera and suipestifer infection. Some animals die suddenly after a couple of days of illness; others linger for 2 weeks or even longer.

**CAUSE AND LESIONS.**—The cause of swine dysentery has not been determined. The disease develops in healthy pigs when they are fed the contents of intestines from affected pigs.

The lesions (tissue changes) found in pigs that have died after a short illness are mostly in the large intestine. The lining is inflamed and bloody. In later stages shreds and patches of dead tissue are found attached to the walls of the intestine or loose in the bowel. Lesions may be found in other parts of the body when complications set in.

**CONTROL.**—Many remedies have been used to treat and control swine dysentery. Favorable results have been reported following the

use of some of them, but as yet none has had enough merit to be recommended as a specific treatment.

The best results in controlling the disease have been obtained by relying on sanitation as a means of prevention; no means of vaccination or immunization is known. As affected pigs and possibly those that have recently recovered are the common sources of infection, great care should be used when swine from the outside are brought to a farm where there is a herd of healthy pigs. The new group should be isolated and quarantined where it may be observed for at least a week, preferably longer, before being added to the healthy herd.

If swine dysentery has become established in a herd, the apparently healthy pigs should be separated from the sick ones and both groups moved to clean quarters. The healthy group should be observed closely, and if any of them sicken they should be removed immediately. In this way the number of pigs that become sick can be held to a minimum.

#### ANTHRAX

Anthrax, an infectious disease, usually attacks cattle, horses, and sheep. Hogs are less susceptible to the disease than other types of livestock but may contract it in an acute, subacute, or chronic form usually as a result of eating contaminated foodstuffs, most frequently the carcasses of animals dead of anthrax. It may also be acquired by pasturing on infected soil or by drinking water contaminated with anthrax organisms. Farm cats and dogs acquire the disease by eating infected meat and man gets it by handling the carcass of an animal dead of anthrax.

**CAUSE.**—Anthrax is caused by a specific micro-organism, *Bacillus anthracis*. On leaving the infected animal, this organism forms spores which are exceedingly resistant and may survive in the soil for years. Contamination of the soil with infectious material is brought about in several ways. Surface water may bring the spores of anthrax from infected places and deposit them; dust containing spores may be carried by the wind; but evacuations of infected animals and the carcasses of animals which have died of anthrax are the usual means of infecting the soil.

**SYMPTOMS.**—In the most common form of anthrax in hogs the lesions are principally confined to the region of the throat. There may be marked swelling of the throat, causing considerable difficulty in swallowing and breathing. In cases where there is no swelling, the symptoms are only debility, decrease in appetite, and hiding under bedding.

In the acute form the symptoms of anthrax appear suddenly, and often the animals are dead before anything wrong has been observed. A diseased animal runs a high temperature, loses its appetite, and has chills and muscular tremblings. Its breathing is labored, its throat becomes swollen, the mucous membranes are blue, and retching and vomiting may become so severe that it chokes to death. When these conditions are noticed in swine, the possibility of anthrax infection must be considered.

**POST MORTEM CHANGES.**—The outstanding anatomical changes in hogs infected with anthrax are confined principally to the region of the throat, where there is a marked gelatinous and hemorrhagic condition of the connective tissues and lymph nodes. The tonsils are en-

larged and frequently covered with a dark, discolored false membrane. The structures forming the glottis are swollen. Although frequently normal in size and color, the spleen may be enlarged, dark, and soft, where the disease has become generalized.

Local lesions of long standing are sometimes found in the throat region of slaughtered hogs that have made an apparent recovery from an attack of anthrax or in animals that showed no visible signs of anthrax during their life and which were apparently healthy prior to slaughter. In these cases the disease is confined to the pharynx and adjacent tissues, including the lymph nodes of that region. Localization of anthrax in the mesenteric lymph nodes has also been observed. In this chronic, localized type of anthrax the lymph nodes of the head, especially the submaxillary nodes, may be either slightly or greatly enlarged, hard, and fibrous. The cut surface presents a mottled appearance, being produced by areas which are brick red in color, patches or streaks having a dull gray, parboiled appearance, and necrotic foci which may be dry and cheesy. One or both tonsils may show areas of degeneration and necrosis ranging in size from that of a pinhead to that of a silver dollar. The epiglottis may be greatly swollen. Under Federal meat inspection, carcasses of swine showing lesions of chronic cervical anthrax are condemned.

**When anthrax is suspected in a herd DO NOT OPEN any of the suspected carcasses in order to make a diagnosis. This should be done only by an experienced veterinarian, who is able to protect himself and the premises, if the animals died of anthrax.**

**PREVENTION AND CONTROL.**—Vaccines are used extensively for protecting cattle, horses, and sheep against anthrax, but seldom for swine. During outbreaks of the disease, prophylactic vaccination of exposed animals with bacterin, spore vaccine, or anti-anthrax serum, is reported to have yielded satisfactory results. An anthrax serum is available also for treatment of animals already infected with the disease. Although a certain percentage of infected swine will recover without any treatment, the prompt injection of large doses of anti-anthrax serum will hasten recovery of animals showing early symptoms of the disease. Good results have also been reported following the administration of anti-anthrax serum and penicillin. Outbreaks of the disease should be reported promptly to the proper State authorities, who can advise on methods for control.

Do not under any circumstances feed swine either cooked or uncooked meat from animals that have died. This is of particular importance in districts where anthrax is present. Once anthrax is established in an area it is exceedingly hard and costly to combat.

In the control of anthrax, prompt and effective disposal of carcasses is of the greatest importance. Immediately after finding the animal, cover it with kerosene or crude oil to keep flies, dogs, buzzards, crows, and vermin from the carcass until it is disposed of. If conditions permit, burn or bury the carcass where it is found. To bury the carcass, cover it with a layer of quicklime and then with at least 6 feet of earth. Carcasses should not be buried in low swampy land or adjacent to streams from which the overflow may inundate the grave, or on a hillside where there is a possibility that subsurface drainage may reach the surface at lower places nearby. The area above and around the grave should be saturated with oil and burned over.

When anthrax is prevalent, it is advisable for the owner to keep all his own dogs tied up, and in every possible way attempt to prevent stray dogs from coming on the premises.

**DO NOT OPEN** the carcasses or allow secretions to drip from natural openings. Close them with cotton soaked in disinfectant before removing the carcasses for burning. This disease is transmissible to man, and great care must be observed in handling the carcasses so as not to get infectious material into cuts or scratches in the skin. Such an infection may have fatal results.

Lye is one of the most effective disinfectants. To disinfect premises against anthrax, a 5-percent solution is recommended. Soak with disinfectant the ground and all equipment with which anthrax-infected swine have been in contact. Then scrape the ground removing all litter, bedding, and manure in the lot used by sick hogs, as well as a little of the top soil. Burn this, or mix it with quicklime. Do not let swine come in contact with this material. Then soak the ground again with disinfectant.

The sheds and other building should be thoroughly saturated with the solution and then should not be used for at least a day. Wash the sheds thoroughly with clean water before livestock are returned to them.

**Concentrated lye is a caustic poison. Care should be taken to avoid getting any of it into the eyes and breathing in any of the fine dust that may arise while handling the dry material. A dust respirator having full face protection would be an additional safeguard. Solutions should be so disposed of as to prevent injury to livestock.**

Thorough inspection of premises where outbreaks of anthrax have occurred may disclose pools or marshlands that are potential sources of infection. Such places, as well as parts of pasture lands known to be heavily infected, should be fenced off insofar as practicable.

#### **SWINE PLAGUE (HEMORRHAGIC SEPTICEMIA)**

Swine plague, or hemorrhagic septicemia, may be classed more as a secondary or complicating condition than as a primary disease. Transmission from animal to animal, although possible, appears to be rare. This infection may occur as a septicemia or in a pulmonary form, which is essentially a type of swine pneumonia, the form most frequent in this country.

**CAUSE.**—Swine plague is caused by a specific organism, *Pasteurella suisepica*, which is often found in the respiratory tracts of apparently normal hogs. It may exist without doing harm to its host until the vitality of the hog is lowered through disease or other factors, such as shipping, weaning, improper feeding and housing, or as a result of lung irritation caused by excess dust. In such cases the germ attacks the weakened tissues, and swine plague results. This accounts, perhaps, for the fact that swine plague is often a complication in connection with hog cholera, necrotic enteritis, or in hogs infested with internal parasites. When hog cholera and swine plague are present in the same animal at the same time, it is practically impossible, even with a post mortem examination, to establish a line of demarkation between them.

**SYMPTOMS.**—These are not characteristic and vary with the disease or factor to which swine plague is secondary.

**PREVENTION.**—Handle outbreaks of suspected swine plague as hog cholera until the latter has been eliminated as the possible cause of the trouble. Since the germ causing swine plague may be present in healthy swine and become active when the vitality is lowered, prevention is a matter of maintaining their health and vigor by providing proper feeding and sanitation. Avoid exposure by providing comfortable sleeping quarters. Sera and bacterins are frequently used for the immunization of healthy swine previous to shipment where they may be subjected to unavoidable exposure.

#### SWINE INFLUENZA (HOG FLU)

Swine influenza, or hog flu, sometimes referred to as infectious bronchitis, appears to be widespread, particularly where hogs are raised in large numbers. It is a herd disease, attacking a large percentage of the animals at the same time.

**CAUSE.**—Swine influenza is caused by the combined action of a filtrable virus and the organism *Hemophilus influenza suis*.

**SYMPTOMS.**—Swine influenza is characterized by the sudden prostration of a large portion of the herd. There is complete loss of appetite. Spasmodic breathing, or thumps, is one of the first symptoms noted. When urged to move, the animals may have violent fits of coughing. The eyes may be red, swollen, and weepy. There may be a discharge from the nose, often streaked with blood. Occasionally a hog vomits stringy mucus tinged with bile. In typical cases the temperature ranges from 104° to 108° F., dropping to 103° to 104° in a week, when, if they survive, the hogs are usually back on feed.

**TREATMENT.**—The treatment is almost entirely hygienic. Place the animals in warm, clean, well-bedded quarters, with plenty of fresh air, and provide plenty of fresh drinking water. Give little feed, or none at all, for 24 hours. In herds where good sanitary conditions prevail the mortality in swine influenza is very low. It is not uncommon for an entire herd to be affected, and, even though the clinical symptoms are alarming, all the animals may recover complete within a week. When sanitary conditions are poor, and especially in garbage-feeding lots, secondary complications frequently intervene, accompanied with heavy losses.

#### ARTHRITIS (INFLAMMATION OF JOINTS)

Lameness with or without swelling or enlargement of the joints and surrounding tissue, or enlargements without lameness, have been commonly ascribed to arthritis, sometimes to articular rheumatism.

Some forms of arthritis are common; others are rare. A frequent specific form is caused by the swine-erysipelas organism. Bacteriological studies have revealed the presence of this organism in over 75 percent of the examined cases of arthritis in the carcasses of swine slaughtered in packing plants having Federal inspection.

Another condition in this group, although there may be no actual inflammation of the joints, is caused specifically by nutritional deficiencies in the rations (pp. 23-24).

A third condition in this group is commonly known as navel ill or joint ill. It includes infections with various disease germs. The

infection may be generalized throughout the body or may be localized in certain organs or areas. It commonly begins as a local infection of the navel cord and often spreads from there to other parts, particularly the joints and the areas which surround them. Immediately after birth and before it dries, the stump of the navel cord of baby pigs furnishes a favorable place for the growth of germs from the filth with which it becomes contaminated. When it enters by way of the mouth, the infection may reach the joints but not the navel cord. Sometimes the pigs may become infected from the mother before they are born.

**CAUSE.**—Many different germs cause the infections, but the same ones are not present in all outbreaks. Then, too, while the infection is caused by these pathogenic germs, its development may depend on factors that lower the pig's resistance to disease. In recommending control measures, more importance is now given to such factors as selection of brood sows, care and feeding of the pregnant sow, provision of proper sanitation, housing quarters and pasture, and diet of young growing pigs.

**SYMPTOMS.**—Generally the first sign is depression, and the pigs are not actively inclined to suckle or may refuse to do so entirely. They have a fever and bowel disorders. When the navel cord is affected, there is a discharge of pus or urine or abscess formation. Affected joints are hot, painful, and swollen, and result in stiffness and lameness. Weakness and emaciation follow, and a large number of the animals die. Some may recover completely; others apparently recover but remain unthrifty. Even in some of the apparently recovered cases, lameness and arthritis recur when the pigs are penned up for fattening.

**TREATMENT.**—Treatment at best is far from satisfactory. If examination after birth reveals pigs with infection of the navel cord, they should be separated from the healthy ones as an attempt to prevent the spread of the infection. Other measures, so far as they are practical, may include removal to clean quarters, preferably with access to pasture, washing the sow's udder, disinfection of contaminated pens, opening abscesses and disinfecting them with tincture of iodine or a 5-percent solution of carbolic acid, and applying hot or other stimulating preparations to affected joints.

**PREVENTION.**—Although treatment of this form of arthritis has been unsatisfactory, good results have been obtained for its prevention by carrying out special measures (p. 1).

When arthritis appears in a herd, a veterinarian should be consulted in order that its form may be determined. He is in a position to examine the affected animals and have laboratory tests made if necessary for a diagnosis. Specific recommendation can then be made in accordance with the findings.

#### **VESICULAR EXANTHEMA**

Aside from the damage which may result from it, vesicular exanthema is very important because of its similarity to foot-and-mouth disease. So far, the disease has been known to occur only along part of the Pacific coast.

The disease is characterized by the formation of vesicles (blisters) on the mucous membranes and skin of the snout, sometimes extend-

ing into the nostrils. Vesicles may appear also on the soft tissues just above the hoof and beneath the pads of the feet, causing lameness. The vesicles contain a clear, straw-colored fluid. The temperature is high in the early stages, but drops to normal soon after the vesicles rupture and commence healing. The disease is contagious and may spread rapidly to other animals in the herd. Affected animals generally recover, but suckling pigs may not, probably on account of their inability to nurse.

Vesicular exanthema attacks swine but not cattle or sheep, foot-and-mouth disease attacks all three.

Control of vesicular exanthema includes quarantine and other sanitary measures; control of foot-and-mouth disease involves slaughter of entire herds in which infected animals are found. The United States has had no outbreak of foot-and-mouth disease since 1929. However, veterinarians are always on the alert against its possible introduction from a country where it is present. Suspected cases should be reported immediately to the proper State official.

#### **INFECTIOUS ATROPHIC RHINITIS AND NECROTIC RHINITIS (BULLNOSE, SNIFFLES)**

These conditions affect principally suckling and growing pigs, causing physical changes of either the face, snout, or membranes and bones within the face and snout.

**CAUSE.**—The cause of infectious atrophic rhinitis is unknown though the disease can be transmitted by contact or by artificial inoculation of material from an affected animal into the nasal passages of another pig. Studies indicate that it is not a filtrable virus and no specific bacteria have been isolated consistently. Necrotic rhinitis is commonly thought to arise from the invasion of *Spherocephalus* (*Actinomyces*) *necrophorus* into wounds or abrasions of the head or other parts of the body. Filthy hog lots with poor drainage are contributing factors.

**SYMPOTMS.**—Infectious atrophic and necrotic rhinitis show symptoms that are easily confused. These symptoms give rise to such terms as "sniffles" and "bulldog."

Infectious atrophic rhinitis is characterized by sneezing and may be accompanied by a bloody discharge, and other signs of nasal irritation, such as rubbing the snout against posts or into the ground. This is later followed by atrophy of the bones within the snout and face leading usually to visible distortion of these parts. The snout may be turned to either side, or the face may have a pushed-in appearance.

Necrotic rhinitis on the other hand is characterized by lumps, swellings, or overgrowth of tissue on the head or face, and there is usually no distortion of the snout except that which results from the swelling or overgrowth.

Remember that distortions of the snout may be due to a defect in breeding or to mechanical injury. In either case, whereas the mortality is low, the economic loss is high through interference of the rate of development of the pigs.

**TREATMENT AND CONTROL.**—There is no known treatment for atrophy of the bone in infectious atrophic rhinitis. Control lies in eliminating all "sneezers" when less than a month old along with the litters they are in and the sows. Move all sows with healthy litters to clean hog houses and pasture. Any suspicious looking breeding animal should

also be eliminated. If the infection is widespread through the herd it is advisable to sell the whole herd for slaughter. Thoroughly clean and disinfect the premises before replacements are made.

Treatment for necrotic rhinitis lies in early incising and removing the pus, if possible, from the swellings. Eliminate from the herd advanced cases showing sloughing of the tissues. As with infectious atrophic rhinitis, there is no substitute for sanitary procedures and selection of sound healthy breeding stock.

#### NECROTIC STOMATITIS

Necrotic stomatitis may be classed as a form of necrobacillosis. Its causes are similar to those of necrotic rhinitis. Affected pigs show signs of pain when sucking. Examination of the pig's mouth will reveal a number of inflamed areas, or patches, on the gums, lips, and hard palate, which later develop into necrotic ulcers. There is a sloughing of the tissues, accompanied with a disagreeable odor. The centers of the sloughed patches are white or yellowish-white. The pigs, unable to eat owing to the severe pain, become weak and emaciated.

**PREVENTION.**—Treatment is of little avail once any of the foregoing conditions becomes apparent. In the early stages of the disease the removal of animals to clean ground is sometimes effective. Prevention is the best way to cope with this disease. Clean up mudholes and other damp, insanitary places, move noninfected pigs to clean ground to check the spread of infection, and slaughter infected animals. If infected animals are moved to clean ground in an attempt to effect a cure, they should be placed by themselves until a cure is brought about.

#### BRUCELLOSIS

Brucellosis of swine is usually caused by the organism *Brucella suis*. Swine are also susceptible, though in a lesser degree, to *Br. abortus* and *Br. melitensis* which are the principal causes of brucellosis in cattle and goats, respectively. This disease in swine can cause considerable financial loss and be a hazard to public health.

Susceptible swine become infected through the mouth by ingesting contaminated feed, water, and body discharges. The *Brucella* organism frequently gains entrance to the body through the genital tract at the time of breeding.

The symptoms of the disease vary considerably in different groups of swine. Brucellosis in swine may be characterized by abortions, birth of stillborn or weak pigs, temporary or permanent sterility, posterior paralysis, and lameness. In boars, one or both testicles may be enlarged. Some infected animals show no symptoms and are merely carriers of the disease.

Diagnosis of swine brucellosis is made by the blood serum agglutination test and isolation of the infective organism. The agglutination test has been more effective in diagnosing infection in the herd than in the individual animal. In most infected herds, usually a significant number of animals show high blood titers, whereas an infected individual may not show a titer, or only a low titer.

Good sanitation and herd management play a very important role in the prevention and control of swine brucellosis. One of the most

important measures for preventing the introduction of brucellosis in a swine herd is to purchase replacement stock from a *Brucella*-free source. If this is impossible, all additions to the herd should be purchased subject to the blood agglutination test. It is recommended that these animals be held in quarantine and have two negative tests 60 days apart before being added to the herd. Indiscriminate breeding of sows to a community boar is a dangerous practice.

None of the present drugs, antibiotics, and vaccines have been effective in preventing or curing brucellosis in swine.

In the control of brucellosis in swine, two methods have proved to be the most successful. One method is to dispose of the entire herd, clean and disinfect the premises, and replace the herd with swine from herds free of infection. The other method is to dispose of the infected breeding herd and replace it with *Brucella*-free offspring. This can be accomplished by testing pigs at weaning time and placing the non-infected ones in a clean area. Limited control programs are in effect in several States and many States require a negative blood agglutination test on all swine before admittance into the States. The subject is discussed in detail in Circular No. 781, Brucellosis of Swine.

#### **SWINE POX (VARIOLA SUILLA)**

Swine pox is characterized by small red spots appearing over a large part of the body. The spots grow rapidly until they reach the size of a dime, and in the center of each a hard nodule develops. Within several days pea-sized vesicles, or blisters, develop, which at first contain a clear fluid; later the contents are puslike. These blisters soon dry up, leaving dark-brown scabs, which later fall off. General disturbances such as fever, chills, and refusal of feed may precede the skin changes, but most of the animals do not appear definitely ill. Aggravated cases may be followed by diarrhea, exhaustion, and death.

In uncomplicated cases, very few pigs die. When an outbreak of disease occurs in a herd and examination reveals swine pox lesions, it is well to consider the possibility of some coexisting disease such as hog cholera, especially if some of the animals have died.

**CAUSE.**—Swine pox is caused by two types of viruses. One type is related to that causing pox in other species of animals; the other is not. Swine which recover from the disease caused by one type become immune to further attacks by that type of virus but not to attacks by the other. The course of the disease caused by the virus affecting other animals is more rapid and the lesions are more superficial and disappear sooner than those caused by the other type of virus.

The disease is apparently not transmitted from animal to animal by contact. It is transmitted, however, by hog lice and possibly by other insects.

**TREATMENT.**—No treatment for swine pox is known. Good care and general sanitary measures constitute the best means of controlling the disease and preventing complications that might prove fatal. Keeping swine free of lice is a good preventive measure.

#### **AUJESZKY'S DISEASE (MAD ITCH)**

Aujeszky's disease has been observed in or reported from several States. Although in cattle it is fatal, in swine it usually is relatively

mild and may go unrecognized. However, although relatively mild in swine, Aujeszky's disease is readily transmitted from infected swine to cattle, with disastrous results.

**CAUSE.**—This disease is caused by a filtrable virus. In swine the nose may serve for both the entrance and the exit of the virus. The disease passes readily from swine to swine and from swine to cattle.

**SYMPTOMS.**—In swine, Aujeszky's disease usually is a comparatively harmless affection with transient illness lasting from 1 to 8 days, slight depression, lack of appetite, moderate fever, and rarely nervous involvement. The death loss generally is slight. A very small percentage of cases simulate the disease as it regularly attacks cattle—the swine may refuse to rest, have a frothy saliva, may be unable to drink because of paralysis of the pharynx and there may be spasms of certain muscles, regional paralysis, or general convulsions. The swine may be excited, roll in their bedding, jump to the sides of the pen, and grind their teeth. There may be fever at the beginning of the nervous type of disease, but the temperature soon returns to normal and remains there.

No treatment for the disease is now known. It is important to separate affected hogs from cattle. As the disease may often pass unnoticed in hogs, its presence may not be recognized until fatal cases break out in cattle running with the hogs. Cattle apparently do not affect one another with Aujeszky's disease but pick it up from affected swine. Therefore, when the disease appears in cattle, change the system of management, separate the swine from the cattle, and keep them separated at all times, thus preventing further spread of the disease in the cattle.

#### LISTERELLOSIS

Listerellosis is caused by the organism *Listerella monocytogenes*. It has been recognized more in sheep and cattle than in swine. As yet, little is known about the extent of the disease in swine, as a definite diagnosis has been established in a very small number of cases. Symptoms of abnormal gait, trembling, peculiar movement of the front legs, and sometimes fever have been noticed in affected animals. Since these symptoms also occur in other diseases of swine, only laboratory tests can determine with certainty the presence of this infection.

#### RABIES

While rabies is primarily a disease of dogs and wild carnivora, it may be transmitted to all types of livestock including swine by the bite of a rabid animal.

Rabies is not a common disease of swine, but an average of 55 cases have been reported yearly during the period 1938 to 1950.

The symptoms of rabies in swine are similar to those in dogs. The first manifestation is general irritability, restlessness, and nervous excitement. Animals wander aimlessly around, grunting, rooting up litter and soil, and attacking other swine and even human beings. Affected animals can drink only with difficulty and saliva may drool from the mouth. Symptoms of paralysis in the front and hind quarters with resulting incoordination of movement follow a period of nervous excitement. Affected animals usually die 2 to 4 days after the onset of paralysis.

Cases of suspected rabies in hogs should be reported to the proper State authorities who can advise on methods of control. To prevent the spread of the infection to livestock when outbreaks of rabies in dogs are prevalent, livestock owners should keep all dogs in the area tied up and so far as possible prevent stray dogs from coming on their premises.

Since rabies is transmissible to man, care should be exercised in handling animals affected with the disease. The carcasses of animals that die of the disease should be disposed of by burning or by deep burial under a layer of quicklime covered with at least 6 feet of earth. Under no circumstances should the carcass be fed to other livestock on the farm.

Hogs showing symptoms of the disease should not be butchered as the meat of such animals is unsuitable for human consumption. Farmers' Bulletin 449, Rabies or Hydrophobia, contains further information.

#### **TRANSMISSIBLE "GASTROENTERITIS"**

Transmissible gastroenteritis is a sporadic disease of swine characterized by diarrhea, vomiting, dehydration, and high death losses among pigs under 2 weeks of age. The losses are slight in older pigs. The causative agent of this disease is filtrable.

**SYMPOTMS.**—Vomiting is more frequent in brood sows and profuse diarrhea in shoats. Recovery in older swine is rather prompt and the mortality is low. However, sows cease to lactate and may lose weight. Pigs usually develop a diarrhea, vomit, become dehydrated, emaciated, comatose, and die in 2 to 7 days. Younger pigs die more quickly than older ones. The feces have a marked odor, are fluid, and vary in color from whitish to yellowish green. Death losses vary from 100 percent in very young pigs to 40 to 60 percent in 2- to 3-week-old pigs.

**POST MORTEM.**—Post mortem changes vary depending upon the age of the pigs. In pigs 3 to 4 days old the intestines are lifeless. The contents are fluid and vary in color from whitish to yellowish green. The stomach is filled with curdled milk and is hyperemic. The kidneys show evidence of degeneration and frequently contain urates. In older pigs the disease runs a longer course. The linings of the stomach and intestines are engorged with blood and frequently have necrotic areas. The mesenteric blood vessels are engorged with blood. The outer portion of the kidney is light in color while the inner portion is markedly congested.

**TREATMENT.**—No specific treatment is known. The spread of the disease may be stopped by moving the sows into field houses away from a central farrowing house. Sows which are to farrow within 2 to 3 weeks should be moved to another place and given separate attendance. A break in the farrowing cycle seems to check the spread of the disease. Parent stock seems to develop some resistance to the disease so should not necessarily be sold.

#### **"GUT EDEMA"**

So-called "gut edema" or "dropsy of the bowel" is relatively new in the swine industry of the United States but has been recognized in Ireland and England since 1932.

**CAUSE.**—The causative agent is not known but it is thought to be a specific toxemia. It often occurs after a change of environment or management. A change of feeding often appears to precipitate the disease.

**SYMPTOMS.**—Pigs 10 to 14 weeks of age are more commonly affected, but this disease has been observed in grown animals. Loss of appetite or incoordination, or both, are the first symptoms observed. Edema of the eyelids and surrounding tissues is an important diagnostic symptom. Varying degrees of diarrhea may be observed. Incoordination develops rapidly into paralysis of either the forelegs or hind legs and other parts of the body. Death may occur in 4 to 5 hours after the first symptoms. However, some pigs may be found dead without having had apparent symptoms and a few may have had only mild symptoms. More than 90 percent of the affected pigs may die. There is very little rise in body temperature and little or no tendency for the disease to spread.

**POST MORTEM CHANGE.**—Edema of the subcutaneous tissues of the belly, elbow hock joints, throat region, ears, eyelids, and stomach may be observed on post mortem. The most consistent post mortem finding is edema of the stomach wall between the muscular coat and the mucous membrane. This edema occurs mainly along the greater curvature of the stomach and may be as much as 1½ inches in depth. The mesentery supporting the spiral coil of the colon is often edematous but the walls of the large intestines are not involved. The adjacent mesenteric lymph nodes are usually edematous. Excessive pleural, peritoneal, and pericardial fluid may be found. This fluid gels when exposed to the atmosphere. The muscles are pale and the carcass has the appearance of having been partially bled.

**TREATMENT.**—No specific treatment for this condition is known.

## GENERAL DISEASES

### ANEMIA OF SUCKLING PIGS

Anemia is most often seen in pigs 1 to 8 weeks old, born in the spring or late fall, confined in pens having either cement or tight wooden floors, with no access to soil from which they might obtain iron and copper, and fed entirely on their mother's milk.

**CAUSE.**—Anemia is brought on by a lack of iron and copper in the diet resulting, in part, from insufficient green feed and no opportunity to root in the soil from which the pigs might acquire these necessary elements. The deficiency of these elements in sow's milk is a contributing factor.

**SYMPTOMS.**—At first the pigs look normal and thrive. Even during the first week, however, some show a lack of vigor and their coats become rough and scurfy. They tire from slight exertion and appear depressed. As the disease progresses the affected pigs become weak and thin; the skin over the neck, shoulders, and legs wrinkles; and diarrhea may develop. The pigs frequently die from secondary infection. They may die, however, at 3 to 4 weeks of age while still fat and apparently well nourished.

**POST-MORTEM APPEARANCE.**—The lesions usual in such cases are a dilatation of the heart, which may be pale and flabby, swelling of the throat, excess of fluid in the chest and abdominal cavities, pale and

watery blood, enlargement of the liver, and a paleness of muscles and internal organs.

**PREVENTION AND TREATMENT.**—Much may be accomplished in preventing the disease by covering the floor of the pens with several inches of soil or placing a generous quantity of soil in a box to which the young pigs have access, and providing plenty of green feed for the sow and pigs. Use soil from clean (parasite-free) areas. For greater effectiveness, fortify it with iron and copper salts. These salts should be dissolved in 1 pint of water and sprinkled on the soil and thoroughly mixed with it. The same measures may be used after symptoms of the disease appear. In lieu of this procedure, the sow's udder may be swabbed once each day with a saturated solution of ferrous sulfate during the nursing period. Small tablets of reduced iron are also available for individual dosage of baby pigs. Source of supply and instructions for use may be obtained from a veterinarian. Beneficial results have followed specific medicinal treatment, which should be administered under supervision of a veterinarian.

#### **RICKETS (RACHITIS)**

Rickets, a disease of young animals, is characterized by the failure of growing bone to calcify, or harden, properly.

**CAUSE.**—The disease is caused by a faulty calcium and phosphorus metabolism (assimilation), which results from an inadequate intake or from an abnormal proportion of these minerals in the diet or as a result of vitamin D deficiency.

**SYMPTOMS.**—As a rule, the first symptoms noted are digestive disturbance, such as loss of appetite, bloating (pot-bellied), weakness, and perverse appetite, the pigs eating filth and gnawing each others' tails and ears. Close observation reveals deformity in the leg bones. Severe pains develop in the muscles, bones, and joints of the legs, and the pigs walk with a stilted lame gait. These symptoms are followed by enlargement of the bones of the legs, especially at the joints, and the long bones become quite bowed. Finally, the affected pigs lose weight and become runts.

**PREVENTION.**—The development of rickets may be avoided by proper attention to the feeding and care of pigs after weaning time. Calcium and phosphorus, the bone-building elements, in correct quantities, are essential. The ration for growing pigs should contain at least 0.4 percent calcium and 0.3 percent phosphorus; maintenance of a ratio of one to two parts of calcium to one part of phosphorus is desirable. Desirable also is access to direct sunshine to provide the vitamin D necessary for the efficient use of the calcium and phosphorus in the pig's body.

Properly balanced rations, with minerals available, insure a supply of the bone-building properties after the pigs are no longer nursing. The pigs should have plenty of room for exercise, plenty of sunshine and pure drinking water, as well as clean, warm sleeping quarters.

#### **IODINE DEFICIENCY (HAIRLESS PIGS, GOITER)**

In the Northern and Northwestern States losses among spring litters result from "hairless pigs."

**CAUSE.**—A deficiency of iodine in the feed or water supply of the pregnant sow is the cause.

**SYMPTOMS.**—Affected pigs are usually weak at birth and die within a few hours. Some may be born dead. Such pigs are usually hairless; some may have thin patches of hair. In the region of the throat there may be swelling due to enlargement of the thyroid gland. The skin over the neck and shoulder regions is usually thickened and wrinkled (fig. 4).

**TREATMENT AND PREVENTION.**—Iodine deficiency may be effectively prevented by adding 1 to 2 grains of potassium or sodium iodide to the daily ration of the pregnant sow. Another plan calls for the use of iodized salt, either a small quantity in the feed each day or in place of ordinary salt in the mineral mixture mentioned on page 2. Either method should prevent iodine deficiency in swine raised in the "Goiter Belt." Iodine should not be added to the diet unless it is needed. Too much iodine may overstimulate the thyroid gland.

#### POSTERIOR PARALYSIS

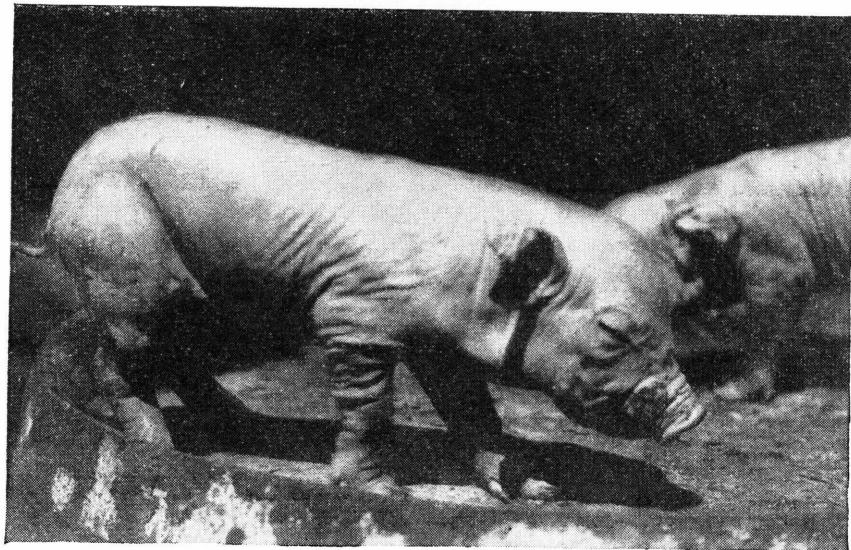
"Posterior paralysis" covers leg weakness, inability to use the hind-quarters, staggering or weaving gait, and incoordination. The condition is commonly a symptom of deficiencies in nutrition and diseases such as brucellosis and erysipelas. Swine are subject to various deficiencies of minerals and vitamins; many of them so affected show degenerative changes in the spinal cord and certain nerves.

Avitaminosis A, a condition due to insufficient vitamin A, or carotene in the diet, is an example of a specific vitamin deficiency. The ration that is frequently used experimentally as one which is deficient in vitamin A consists of white corn, tankage, and minerals. The incoordination or disturbances in locomotion which arise from feeding this ration may vary from a slight posterior weaving gait to complete posterior paralysis so that the hind legs drag when the animal pulls itself along with the forelegs. Sometimes all four extremities are involved. The appetite of affected animals is usually good, but symptoms of night blindness and diarrhea may accompany the muscular incoordination. These symptoms of vitamin A deficiency may be treated successfully by adding enough substances to the ration to correct the deficiency. Adequate supply may be provided in concentrated forms, but good results are also obtained when it is provided from natural sources often at hand, as green feed, yellow corn, or well-cured alfalfa hay or leaf meal having good green color.

Sows farrowing, particularly when rundown and heavily nursed, and pigs suffering from rickets show this leg weakness. Other causes are injuries such as may be received during handling and shipping and specific lesions in the backbone and other places affecting the spinal cord and other parts of the nervous system, such as abscesses, tumors, or lesions of an infectious disease like tuberculosis or brucellosis.

**PREVENTION AND TREATMENT.**—The disease may be prevented largely by providing swine with feeds that satisfy their nutritive requirements. Separate publications on the feeding of swine are available on request.

When sows being heavily nursed are unable to use their hind legs, the pigs should be weaned, and the sow supplied with liberal quantities of green feeds and minerals.



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FIGURE 4.—Newborn hairless pigs showing symptoms of iodine deficiency.

Prevention and treatment of posterior paralysis due to causes other than nutrition depend on the specific cause.

## DISEASES OF HEAD AND AIR PASSAGES

### STOMATITIS (SORE MOUTH)

Stomatitis, an inflammation of the mucous membrane of the mouth, is rather common in swine.

**CAUSE.**—It may result from injury by chemicals or other irritants, from feeding on frozen forage, bearded grains, or foreign bodies, or from injury by ropes used in snubbing. It may be seen also during teething and during the course of certain infectious diseases.

**SYMPTOMS.**—The mucous membrane may be swollen and reddened, and there may be an accumulation of exudate on the tongue and in the recesses of the mouth. Profuse salivation and drooling may be noted in the later stages of stomatitis, and the affected animals refuse hard feed. Thirst is increased.

**PREVENTION.**—Stomatitis can be prevented largely through proper care and management of the herd. In garbage-feeding plants a careful check should be made to see that no foreign bodies or irritants are present in the garbage fed to the hogs. Examine affected animals for the presence of foreign bodies in the mouth. Provide plenty of water and feed thin sloppy feeds until the condition clears up. Keep in mind the possibility that this condition may be a symptom of some infectious disease. If in doubt as to the actual cause, consult a veterinarian.

### PNEUMONIA

Pneumonia in swine is nearly always secondary; that is, it generally accompanies some of the infectious diseases like hog cholera, swine

influenza, or swine plague. In the absence of these diseases, exposure to cold and rain, damp filthy pens, or other influences which lower their resistance are predisposing causes of pneumonia in young pigs.

Inhaling gases, dust, or other foreign material sometimes induces pneumonia, or faulty administration of medicine in a drench may be the cause.

**CONTROL.**—When there is no apparent cause, an infectious disease should be suspected. Consult a veterinarian as to diagnosis and treatment. Avoid exposure to predisposing causes. Provide proper housing, sanitation, and feeds.

## **DISEASES OF DIGESTIVE SYSTEM**

### **DIARRHEA OF PIGS (SCOURS)**

Scours, a very serious ailment of pigs, takes a heavy toll each year from new litters.

**CAUSE.**—This condition is frequently associated with anemia and with mineral and vitamin deficiencies. Further, it may result from improper care of both the sows and pigs, or it may be caused by infection in the sow previous to or during pregnancy. The disease may appear in pigs at an age varying from 1 day to several weeks. When it attacks a pig a day or two old, faulty care and feeding of the mother may be the responsible factors. Overfeeding the sow, improper feeding of the sow (as with garbage containing washing powders and other chemicals that may be secreted in the sow's milk), insanitary environment, poor housing, and improper care of the sow, all serve to lower the natural resistance of the young animals and make them susceptible to the disease.

**SYMPTOMS.**—The chief symptom is constipation, followed by a profuse diarrhea. The discharge from the bowels is thin, fluid-like, grayish-yellow, and of a very foul odor. At first the appetite is not badly impaired, but in a few days the pigs affected stop eating or nursing and soon begin to lose strength and flesh. The coat becomes rough and scurfy, and the little pig squeals with pain when handled.

**PREVENTION.**—As most cases are caused by dietary disturbances, the first step in preventing the disease is to see that the sow is getting the right kind and quantity of feed. Do not overfeed the sow during the first 10 days after farrowing. Do not breed a sow or gilt just recovering or recently recovered from an infectious disease.

If it sets in when the pig is but a few days old, scours is nearly always fatal. Keep the nursing sow in a clean, warm, comfortable pen or shelter where, with her litter, she will have plenty of room, fresh air, and sunshine. Change the bedding daily until scouring ceases. Consult a veterinarian for medicinal treatment.

### **DISEASE OF NEWBORN PIGS**

Among the diseases of young pigs one condition that has been recognized as specific and apparently not associated with pig scours appears in baby pigs generally from 24 to 72 hours after birth. The pigs seem healthy and normal at birth and often are nursing. At the 24-hour period or soon thereafter the pigs become lifeless and weak, wander unsteadily, and may shiver. Often, in this condition, they are too inactive to avoid being crushed by the sow when she lies down, and

as a result they may be found with crushed skulls or internal hemorrhages. Or, as the condition progresses, the pigs may burrow in the bedding and soon pass into a coma. They usually die within 48 hours after the first symptoms appear. Frequently all the pigs in the litter die, but sometimes only part of the litter is affected. The condition has been reported from herds where the rations of grains and supplements have been considered adequate and from herds maintained principally on garbage.

Post-mortem examination reveals no constant lesion. Sometimes, however, one or more changes are apparent. The liver may be yellowish or deep red. The most common change, perhaps, is a large quantity of curdled milk in the stomach. Some pigs may show a slight enteritis. Evidence of diarrhea is unlikely, except in pigs in which the condition is prolonged. The sugar in the blood of affected pigs is apparently much lower than in healthy pigs of the same age, but the cause of this decrease in blood sugar (hypoglycemia) has not been determined.

Treatment of the affected pigs with injections of glucose and force feedings of milk during the early stages of the disease are beneficial.

#### **GASTROENTERITIS (INFLAMMATION OF STOMACH AND INTESTINES)**

When a number of pigs in a herd are sick and post-mortem examination of one that dies reveals a reddish color in the lining of the stomach and intestines, suspect an infectious disease unless some obvious cause is found. Consult a veterinarian, to determine what disease is present and what treatment should be given.

Inflammation of the stomach may result from the action of irritating substances, such as lye and washing compounds, from drinking brine, or from eating too much salt, as well as from many forms of poisoning.

#### **EVERSION OR PROLAPSE OF RECTUM (PILES)**

Eversion, or prolapse, of the rectum is commonly referred to as piles.

**CAUSE.**—A chronic constipation or a diet which is irritating to the lower bowel may be the cause.

**TREATMENT.**—At first only a small part of the rectum may protrude. If proper treatment is given then, recovery may be effected without complications. However, the condition may become worse so that several inches of the rectum are exposed. An obstinate constipation may follow, causing an auto-intoxication and the death of the animal.

When the condition is first noticed, wash the prolapsed part of the rectum with warm water, anoint it with glycerin or olive oil, and replace it by gently pushing it inward with the fingers. The operator's hands should be carefully cleansed before beginning treatment. After the prolapsed portion has been returned to its normal position an enema may be given to flush out the lower bowel and remove any accumulation of feces which might cause further straining. Withhold all feed for a day or two. Then give the animal an easily digested laxative diet consisting mainly of thin slop and bran mash.

If the protruded portion of the rectum is much swollen and infected, it may be impossible to replace it. It should then be amputated, which calls for the services of a veterinarian. When the operation has not been delayed too long and is performed properly results are usually satisfactory.

## DISEASES OF REPRODUCTIVE SYSTEM

### MASTITIS (GARGET)

Mastitis, also known as garget, is an inflammation of the mammary glands, or udder.

**CAUSE.**—Improper care and feeding of brood sows, particularly just before and after farrowing, contribute greatly to the cause of this condition. The sow's udder hangs close to the ground, so that it is subject to frequent cuts and bruises and is thus exposed to invasion by infective germs in the litter and soil. Under such conditions, infection finds its way into the tissues through abrasions, sometimes reaching the inner substance of the glands through the openings in the teats. Inflammation and painful swellings, and often numerous abscesses result.

**SYMPOTMS.**—The symptoms of mastitis are recognized easily. They are a swollen condition of the mammary glands, which are hard and hot to the touch, loss of appetite, and fever. The sow often refuses to let the pigs suckle because of intense pain. The milk may be stringy or clumpy.

**TREATMENT.**—Many cases of mastitis may be prevented by providing proper care, feeding, and quarters for brood sows. This includes washing the sow's udder with soap and water at the time she is moved to clean, dry, farrowing quarters which have been previously disinfected and bedded, and reducing the quantity of her feed just before and after farrowing. Detailed information on these measures is given in Farmers' Bulletin 1437, Swine Production. Inflamed udders should be treated with hot applications and massaged twice a day to reduce the swelling. Proper drainage of abscesses should be provided.

### METRITIS (INFLAMMATION OF WOMB)

Metritis, sometimes better known as pig-bed fever, is an inflammation of the uterus (womb). It arises from infection and may generally be traced to an association with some factor of reproduction, such as breeding, pregnancy, abortion, retention of a dead pig or afterbirth, or assistance given during difficult farrowing. Various specific infections may cause the trouble. The infection may be brucellosis (infectious abortion) and spread to other animals.

Swelling of the external genital organs and a foul-smelling discharge from the vagina usually indicate metritis. Chills, depression, restlessness, fever, and loss of appetite may occur also.

When metritis breaks out in a herd, it is important to consult a veterinarian at once, not only to determine the proper treatment for the sick animal but also to ascertain the specific organism involved. Proper treatment may save the life of the animal. Also an early diagnosis may make it possible to prevent the spread of the infection to the rest of the herd and to avoid similar trouble at future farrowing seasons. Proper selection of breeding stock and good care and feeding of brood sows (Farmers' Bulletin No. 1437, Swine Production) may help to prevent metritis.

**TREATMENT.**—Metritis should preferably be treated by a veterinarian. When such services are not available, removal by hand of any pigs or afterbirth and irrigation of the uterus may be helpful. The hands of the operator should be washed with soap and water and

coated with olive oil or petrolatum before being inserted in the uterus. Flushing the uterus with mild antiseptics or salt water may be done with a small rubber tube attached to a funnel. After the irrigating fluids have been allowed to run into the uterus, they may be siphoned out by lowering the outer end of the rubber tube. Fluids frequently used are a 0.5-percent Lugol's solution, prepared by adding a tea-spoonful of Lugol's solution to a gallon of water, or a salt solution, prepared by adding a heaping tablespoonful of dry salt to a gallon of water. The water used should first be boiled and then cooled to body temperature. If the solutions are too strong, they may do more harm than good.

The affected animal should be kept isolated until recovery is complete, after which it should be fattened for slaughter at the first opportunity.

## **DISEASES OF SKIN**

### **ERYTHEMA**

Erythema is a persistent redness of the skin. Although the skin may be reddened by pressure, rubbing, blows, scalds, burns, freezing, exposure to sunlight, chemical irritants, or irritating secretions from beetles, caterpillars, and lice, reddening may also accompany a specific infectious disease, such as hog cholera and swine erysipelas. It has been associated also with faulty elimination, excess of certain feeds, spoiled feed, and abnormal putrefactive processes in the intestines.

Treatment depends entirely on the cause. If the cause is too much sun, provide shade; if it is feed, change over to a thin sloppy ration for a few days until the condition clears up. Try to remove the cause whatever it may be. Consult a veterinarian in order to eliminate the possibility of an infectious disease.

## **OTHER AFFLICTIONS**

### **INJURIES FROM TEETH OF SUCKLING PIGS (NEEDLE TEETH)**

Pigs are born with black, or needle, teeth. Though perfectly normal, these teeth often irritate or pain the sow, especially at first when the udder is sore to the touch. Cut the needle teeth off before placing the pigs with the sow to nurse. Do not attempt to break the teeth off. Use sharp side-cutting pliers and cut about halfway between the jaw and the point of the tooth.

### **POISONING**

Poisoning in swine is common. The symptoms often resemble those of hog cholera, but seldom include fever.

**CAUSES.**—Hogs may be poisoned by spoiled feeds, by consuming garbage containing washing compounds, lye, other caustics or irritating substances, by drinking salt brine, or by having access to a disinfectant, such as carbolic acid, bichloride of mercury, or cresylic disinfectants. Poisoning may result also from feeding on such plants as tarweed, waterhemlock, cocklebur, wild cherry, and the deadly nightshade. If cottonseed meal is fed in excess of 9 percent of the total ration there is danger of injuring the hogs.

**SYMPTOMS.**—Salt brine, lye, and mercury poisoning produce about the same symptoms—thirst, restlessness, lack of appetite, colicky pains, vomiting, muscular weakness, and at times paralysis. Salt

brine causes frequent urination also. Cottonseed-meal injury gives rise to irregular appetite, thumps, unthriftiness, weakness, unsteady gait, and, in severe cases, blindness. These symptoms are probably due to vitamin A deficiency.

Symptoms caused by plant poisoning are as follows:

Tarweed, or hard liver disease: Failure to make normal gains, jaundice, rough hair coat, poor condition, and death.

Waterhemlock: Nervousness, muscular twitching, severe convulsions, and death.

Cocklebur: Depression, vomiting, staggering and labored breathing, followed within a few hours by death.

Wild cherry: Sluggishness, staggering, labored breathing, convulsions, and death.

Deadly nightshade: Nausea, vomiting, labored breathing, excitement, and convulsions.

One or more of the sick or dead hogs should be autopsied by a veterinarian. If lesions and history point to poisoning, transfer the hogs to a safe place until the poison, plant, or mineral is removed. The veterinarian also may recommend specific medication.

#### OVERHEATING (HEATSTROKE)

Overheating is common in swine during hot weather.

**CAUSE.**—This condition may result either from exposure to sun or from extreme exertion. The nature and conformation of this class of animals make them susceptible to such a condition.

**SYMPTOMS.**—Hogs show signs of overheating rather suddenly. They gasp for breath, grow restless for a few minutes, wabble in their walk, and finally fall over on their sides, going into convulsions. The body temperature is extremely high, having been known to rise above 110° F. Hogs in an overheated condition need prompt attention if they are to be saved.

**PREVENTION AND TREATMENT.**—Carelessness on the part of some one, of course, is responsible for the overheating of hogs, for the animals will not remain in the hot rays of the sun or exercise unduly in extremely hot weather unless they are compelled to do so. Provide swine with plenty of shade both in the hog lot and in the pasture. In the absence of natural shade provide artificial shade. A concrete wallow may also be provided. Drain and clean it frequently. Add a thin layer of oil to the water to control lice infestation. When an animal shows signs of heat prostration, pour cold water on the head but not over the entire body, until the animal revives.

#### SPASMS AND CONVULSIONS

Spasms and convulsions, characterized by general restlessness, muscular tremblings, loss of appetite, vomiting, staggering gait, jerking of the head and legs, and loss of consciousness, may occur as a result of concussion of the brain, lightning, heatstroke, worm infestation, food poisoning, diseases of the brain, diseases of the kidneys, anemia, intestinal disturbances, stomatitis, and specific diseases such as swine erysipelas, hog cholera, Aujeszky's disease, and listerellosis.

Treatment will depend entirely upon the cause. It usually requires diagnosis by a veterinarian.